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F-16XL-1 Testbed Aircraft

F-16XL-1 in flight. NASA photo EC95 42960-1

NASA Dryden Flight Research Center's F-16XL 1 aircraft (tail number 849) is a testbed aircraft for flight research projects.

Recently, the XL-1 aircraft was upgraded with a new Digital Flight Control System (DFCS). The DFCS utilizes an electronic flight control system coupled with a digital computer, replacing the F-16XL-1's original analog computer. The DFCS modification is equivalent to the U.S. Air Force F-16 upgrade known as Block 40. The aircraft's fly-by-wire flight control system remains intact.

The DFCS upgrade allows NASA's F-16XL-1 the flexibility needed to perform experiments which require major new flight control functions or capabilities. The initial flight test objectives for the modified aircraft verified that the DFCS functioned properly and that the performance and handling qualities were acceptable throughout the flight envelope.

The added flexibility of the DFCS increases the versatility of this aircraft as a testbed for aerodynamic research and investigation of other advanced technologies. The aircraft's instrumentation system is able to monitor control system operations, and is capable of supporting additional measurements.

The digital flight control system is compatible with a Research Flight Control System (RFCS) which can be installed when necessary. RFCS capability provides a flexible, reliable and safe means to modify the aircraft control system. ARFCS computer also significantly increases computational speed and computer memory. Previous applications of RFCS computers on other aircraft include investigation of alternate control methods and the integration of additional flight controls such as thrust vectoring vanes and forebody strakes.

The XL-1 aircraft was previously used in NASA's Cranked-Arrow Wing Aerodynamics Project, or CAWAP, which provided aerodynamic data for the NASA's High Speed Civil Transport (HSCT) research program. The unique cranked-arrow wing shape provided better low-speed lift and handling characteristics than the modified "double-delta" wing used on the Concorde supersonic transport (SST). An improved wing design is considered essential to future SST aircraft.

The XL-1 also was used in NASA's 1995 sonic boom study, in which the aircraft flew 200 feet behind a NASA SR-71 to probe the boundary of the SR-71's supersonic shock wave. These tests measured and recorded the shape and intensity of the shock waves.

These studies will help HSCT engineers better control the size and shape of future HSCT supersonic shock waves to reduce sonic boom intensity near populated areas.

Future projects awaiting the XL-1 aircraft may include automatic landing system research and development, control law software testing, and even industry-led unpiloted combat air vehicle system testing.

Three Pillars

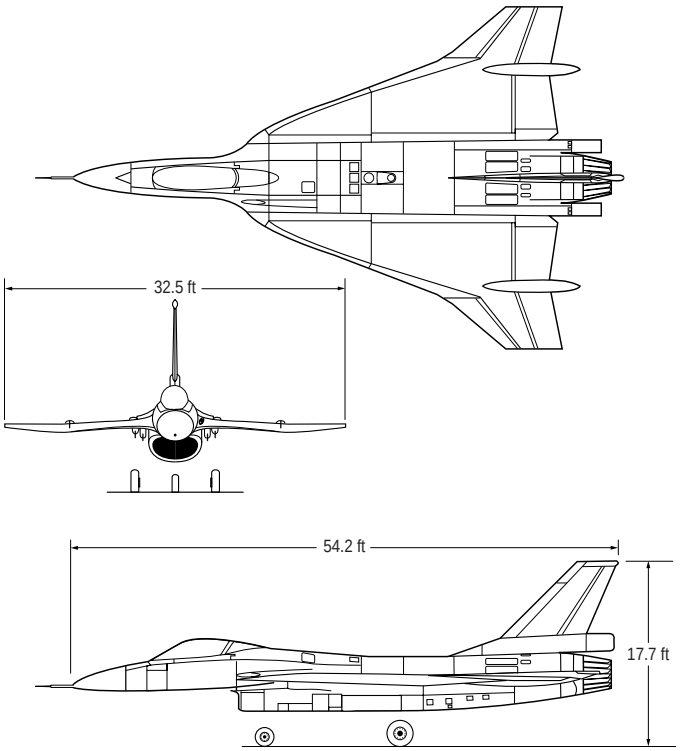
NASA's F-16XL-1 over the desert. NASA photo EC97 44354-3

Dryden's F-16XL-1 aircraft supports all of NASA's technology "pillars" which represent the aggressive long-range goals of NASA's Office of Aeronautics and Space Transportation Technology, also known as the Aeronautics Enterprise. The Aeronautics Enterprise is one of the four NASA Strategic Enterprises established to address key agency activities in distinctly different areas.

One goal of Pillar One, known as Global Civil Aviation, is to reduce the noise of civil aircraft. The Concorde SST is severely restricted from flying near populated areas due to the intensity of its sonic boom. The sonic boom propagation studies the F-16XL-1 participated in provided data that may be incorporated in future supersonic transport aircraft designs, in hope of quieting them for use at more of the world's airports.

Pillar Two, known as Revolutionary Technology Leaps, has a goal of revolutionizing air travel by reducing commercial air travel times. The HSCT work done by the F-16XL-1 in the CAWAP project provided essential information necessary for an improved wing design for future SST aircraft.

In support of Pillar Three, called Access to Space, the F-16XL-1 may be used to support testing of advanced air vehicle automatic landing systems with the intention of lowering the operational costs of those vehicles and follow-on spacecraft. The primary goal of Pillar Three is to lower the cost of putting payloads into orbit.



Three-view drawing of F-16XL aircraft.

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